WHAT IS CLAIMED IS:

1. An isolated nucleic acid encoding a CNG3B subunit of a cation channel, the polypeptide:

(i) forming, with at least one additional alpha subunit, a cation channel having the characteristic of cyclic nucleotide-gating; and

(ii) comprising a subsequence having at least 85% amino acid sequence identity to amino acids 210 to 661 of SEQ ID NO:1.

2. The nucleic acid of claim 1, wherein the polypeptide specifically binds to antibodies generated against a polypeptide comprising an amino acid sequence of SEQ ID NO:1.

3. The nucleic acid of claim 1, wherein the nucleic acid encodes a polypeptide comprising an amino acid sequence of SEQ ID NO:1.

4. The nucleic acid of claim 1, wherein the nucleic acid comprises a nucleotide sequence of SEQ ID NO:2 or SEQ ID NO:3.

5. The nucleic acid of claim 1, wherein the nucleic acid is amplified by primers that selectively hybridize under stringent hybridization conditions to the same sequence as the primers selected from the group consisting of:

TCTATCTCCTGTGGCTCTTGCTTGTC (SEQ ID NO:4)

GAGTCTGGGCTGGATAAATAGCATATC (SEQ ID NO:5)

AGGAATTGGCACTACTAGATGGGTG (SEQ ID NO:6)

TTCATGAGGATCCTTTCAGAATCTGG (SEQ ID NO:7)

GGAAACCGTCGAACTGCCAATGTGGT (SEQ ID NO:8)

CGGGTTTGCCAATCTTTTAACTCTAGAC (SEQ ID NO:9)

GTCCGCAATAAGCCAGTAGTGTATG (SEQ ID NO:10)

TGACAAGCTTCCGCCATGTTTAAATCGCTGACAAAAGTC (SEQ ID NO:11) and

TGACGAATTCTCCCAGCATGTCGTTTCCCCTCGTTAA (SEQ ID NO:12), wherein the amplification reaction comprises forty cycles comprising a denaturation phase of 95°C for fifteen seconds, an annealing phase of 58°C for fifteen seconds, and an extension phase of 72°C for 2.5 minutes.

6. The nucleic acid of claim 1, wherein the polypeptide comprises a beta subunit of a heteromeric cyclic nucleotide gated cation channel.

7. The nucleic acid of claim 1, wherein the nucleic acid specifically hybridizes under moderately stringent hybridization conditions to a nucleic acid comprising a nucleotide sequence of SEQ ID NO:2 or SEQ ID NO:3, wherein the hybridization reaction is incubated overnight at 37°C in a solution comprising 40% formamide, 1 M NaCl and 1% SDS, and washed at 45°C in a solution comprising 1x SSC.

8. An isolated nucleic acid encoding a CNG3B subunit of a cation channel, the nucleic acid specifically hybridizing under stringent conditions to a nucleic acid comprising a nucleotide sequence of SEQ ID NO:2 or SEQ ID NO:3, wherein the hybridization reaction is incubated overnight at 42°C in a solution comprising 50% formamide, 5x SSC and 1% SDS, and washed at 65°C in a solution comprising 0.2x SSC.

9. An isolated nucleic acid that specifically hybridizes under stringent conditions to a nucleic acid encoding an amino acid sequence of SEQ ID NO:1, wherein the hybridization reaction is incubated overnight at 42°C in a solution comprising 50% formamide, 5x SSC and 1% SDS, and washed at 65°C in a solution comprising 0.2x SSC.

10. A method of detecting a nucleic acid, the method comprising contacting the nucleic acid with an isolated nucleic acid of claim 1.

11. An isolated polypeptide comprising a CNG3B subunit of a cation channel, the polypeptide:

(i) forming, with at least one additional alpha subunit, a cation channel having the characteristic of cyclic nucleotide-gating; and

(ii) comprising a subsequence having at least 85% amino acid sequence identity to amino acids 210 to 661 of SEQ ID NO:1.

12. The polypeptide of claim 11, wherein the polypeptide specifically binds to antibodies generated against SEQ ID NO:1.

13. The polypeptide of claim 11, wherein the polypeptide has a molecular weight of between about 87 kD to about 97 kD.

14. The polypeptide of claim 11, wherein the polypeptide has an amino acid sequence of SEQ ID NO:1.

15. The polypeptide of claim 11, wherein the polypeptide comprises a beta subunit of a heteromeric cyclic nucleotide-gated cation channel.

16. An antibody that specifically binds to the CNG3B polypeptide of claim 11.

17. The antibody of claim 16, wherein the polypeptide to which the antibody binds has an amino acid sequence of SEQ ID NO:1.

18. An expression vector comprising the nucleic acid of claim 1.

19. A host cell transfected with the vector of claim 18.

20. A method for identifying a compound that increases or decreases ion flux through a cation channel, the method comprising the steps of:

(i) contacting the compound with a CNG3B polypeptide subunit, the polypeptide

(a) forming, with at least one additional alpha subunit, a cation channel having the characteristic of cyclic nucleotide-gating; and

(b) comprising a subsequence having at least 85% amino acid sequence identity to amino acids 210 to 661 of SEQ ID NO:1; and

(ii) determining the functional effect of the compound upon the cation channel.

21. The method of claim 20, wherein the functional effect is a physical effect.

22. The method of claim 20, wherein the functional effect is a chemical effect.

23. The method of claim 20, wherein the polypeptide is expressed in a eukaryotic host cell or cell membrane.

24. The method of claim 23, wherein the functional effect is determined by measuring ion flux, changes in ion concentrations, changes in current or changes in voltage.

25. The method of claim 20, wherein the functional effect is determined by measuring ligand binding to the channel.

26. The method of claim 20, wherein the polypeptide is recombinant.

27. The method of claim 20, wherein the cation channel is heteromeric.

28. The method of claim 20, wherein the polypeptide is human CNG3B.

29. The method of claim 20, wherein the polypeptide has an amino acid sequence of SEQ ID NO:1.

30. A method for identifying a compound that increases or decreases ion flux through a cyclic nucleotide-gated cation channel comprising a CNG3B polypeptide, the method comprising the steps of:

(i) entering into a computer system an amino acid sequence of at least 35 amino acids of a CNG3B polypeptide or at least 105 nucleotides of a nucleic acid encoding the CNG3B polypeptide, the CNG3B polypeptide comprising a subsequence having at least 85% amino acid sequence identity to amino acids 210 to 661 of SEQ ID NO:1;

(ii) generating a three-dimensional structure of the polypeptide encoded by the amino acid sequence;

(iii) generating a three-dimensional structure of the compound; and

(iv) comparing the three-dimensional structures of the polypeptide and the compound to determine whether or not the compound binds to the polypeptide.

31. A method of modulating ion flux through a CNG cation channel comprising a CNG3B subunit to treat a disease in a subject, the method comprising the step of administering to the subject a therapeutically effective amount of a compound identified using the method of claim 20 or 30.

32. A method of detecting the presence of CNG3B in human tissue, the method comprising the steps of:

(i) isolating a biological sample;

(ii) contacting the biological sample with a CNG3B-specific reagent that selectively associates with CNG3B; and,

(iii) detecting the level of CNG3B-specific reagent that selectively associates with the sample.

33. The method of claim 32, wherein the CNG3B-specific reagent is selected from the group consisting of: CNG3B-specific antibodies, CNG3B-specific oligonucleotide primers, and CNG3B-nucleic acid probes.

34. In a computer system, a method of screening for mutations of a human CNG3B gene, the method comprising the steps of:

(i) entering into the computer a first nucleic acid sequence encoding a CNG3B polypeptide having a nucleotide sequence of SEQ ID NO:2 or SEQ ID NO:3, and conservatively modified versions thereof;

(ii) comparing the first nucleic acid sequence with a second nucleic acid sequence having substantial identity to the first nucleic acid sequence; and

(iii) identifying nucleotide differences between the first and second nucleic acid sequences.

35. The method of claim 34, wherein the second nucleic acid sequence is associated with a disease state.